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ECONOMIC AND SOCIAL RAMIFICATIONS OF TRENDS IN THE ISRAELI HI-TECH INDUSTRY

The Israeli Hi-Tech industry has evolved to become one of the most important sectors of the Israeli economy to the extent that the country is now labeled as the "start-up Nation". The present paper presents recent trends in the Israeli Hi-Tech industry. The ramifications of these trends to the Israeli economy are discussed. In addition, the paper shows that the accelerated technological development has some social effects, not all positive.

Key words: Hi-Tech industry, trends, social effects, economic impact.

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ЭКОНОМИЧЕСКИЕ И СОЦИАЛЬНЫЕ ПОСЛЕДСТВИЯ ТЕНДЕНЦИЙ В ИНДУСТРИИ ВЫСОКИХ ТЕХНОЛОГИЙ ИЗРАИЛЯ

Израильская индустрия высоких технологий превратилась в один из самых важных секторов экономики страны настолько, что сейчас она известна, как «страна – Start-up». В статье представлены последние тенденции в индустрии высоких технологий Израиля. Обсуждаются некоторые последствия этих тенденций для экономики Израиля. Кроме того, статья показывает, что ускорение развития технологий приводит к некоторым социальным эффектам, которые не всегда носят позитивный характер.

Ключевые слова: индустрия высоких технологий, тенденции, социальные эффекты (воздействия), экономический эффект.

Introduction

Recent trends in the Israeli economic and business arenas have attracted a worldwide attention. Many experts are focusing on the past 15 years, a period during which a number of recessions inflicted Western countries, and in particular the USA. In contrast, the Israeli economy showed resiliency and was less affected by these downturn forces. Given this outstanding performance, one would expect to observe similar trends in the welfare of the Israeli population. However, the opposite is observed in typical measures of social welfare, such as poverty and inequality. This paper will present recent trends in the Israeli economy, the parallel trends in social welfare. Next, it will present recent developments in the Israeli Hi-Tech industry and show how both economic and social welfare opposing trends may be affected by the Hi-Tech industry.

Recent Trends in the Israeli Environment

Economic Trends

Let us look at some economic indicators. The table in the following page is extracted from the most recent OECD statistical report on the Israeli economy [1]. It presents 8 years data from 2005 to 2013 of key economic variables. It should be noted that this period includes the 2008–2010 economic crisis during which the USA and practicaly all OECD countries expe-

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rienced recession with declines in economic activities and hugh unemployment rates.

As can be seen in Table 1, during the whole 2005–2013 period, per capita GDP increased from 23,210 US $ to 29,830. For two years of the crisis GDP hardly changed. Real GDP increased by 1,1 % to 5,9 % annually. International trade was balanced but its share in the Israeli GDP declined due to the recession in the economies of the Israeli trading partners. Considering the relatively small size of Israel the extent of foreign direct investment (FDI) in stocks is outstanding, ranging from 23,083 Million US$ outward flow in 2005 to 73,987 Million outward flow in 2012. It should be further noted that since the beginning of the crisis, outward flows have exceeded inward flows, indicating that Israeli investors took advantage of their relative strength and increased their holdings of foreign stocks that declined in value. The last two rows of the table show that during the whole period inflation and unemployment were low, indicating that the Israeli economy is healthy economy, out performing those of most other developed countries. We intend to show that this strength can be attributed, at least in part, to the role of the Israeli Hi-Tech industry.

Social Welfare

The OECD (2014) special report on Israel [1], included a study about social welfare in Israel in comparison with that of OECD countries as well as that of the European Union. Measuring relative poverty as the percent of the population earning less than half median income, the reported 19,9% poverty rate in Israel was found to be the highest of all EU and OECD countries and twice that of the OECD average of 11,3 % and EU average of 9,2.

Income inequality was measured by Gini scale and by the ratio between the richest and poorest 10 percentiles. The OECD estimated the Gini coefficient in Isael to be 0,376. In comparison, for the same year OECD estimate the average Gini coefficient for the EU countries to be 0,291 and the corresponding average for OECD countries is 0,313. The following table provides the trend of Gini from the mid 1980sto the late 2000s for three industrial countries.

It should be observed that during the 25 years period, inequality increased in the three countries with the UK between Israel and the USA and with Israel approaching the level of the USA, the country with highest level of inequality among the developed nations.

Using the ratio between the richest and poorest 10 percentiles, Israeli inequality was estimated tobe 13,4, meaning that the income level of the highest population percentile was 13 times higher than the corresponding figure for the lowest percentile.In comparison, the OECD reported measure of inequality was only 6,9 for the EU average and 9,2 for the OECD average. Both measures indicate that income inequality in Israel is higher than in almost all other developed counties.

Table 3 presents Israeli monthly household income by 10 deciles (percentiles). The row labeled D10/D1 provides the ratio between each value by the value of the lowest income group. The value in column 10 is the typically used measure of inequality. It shows that the income of the richest group is 9 times larger than that of the poorest group. It should be noted in passing that this value is in line with the OECD average and far below the value reported in the OECD study of Israel. The row labeled D(i)/D(i-1) provides the ratio between each income value and the one just below it. It represents the degree of inequality between adjacent social strata. It shows that the poorest group is far below while the richest group is fsr above the remaining groups.

The OECD Israeli social welfare report, characterizing Israel as a country with very high rates of poverty and income inequality, triggered wide discussions in the Israeli media, with many asking how a strong economy, such as the Israeli one,can perform so poorly in terms of social welfare (Bassok, Moti [3]; Dattel, Lior and Feldman, Nadan [4]; Grave-Lazi, Lidar [5]). One explanation suggests that

Table 1

Country statistical profile: Israel 2013

	Unit	2005	2006	2007	2008	2009	2010	2011	2012
Production and income									
GDP per capita	USD current PPPs	23 210	23 808	25 477	25 463	25 929	27 085	28 905	29 830
Economic growth									
Real GDP growth	Annual growth %	4,9	5,8	5,9	4,1	1,1	5,0	4,6	3,2
Trade									
Imports of goods and services	% of GDP	43,2	42,6	44,1	41,6	32,3	34,9	37,8	38,5
Exports of goods and services	% of GDP	42,8	42,8	42,6	40,5	35,0	37,2	37,3	37,4
Foreign direct investment (FDI)									
Outward FDI stocks	Mln USD	23 083	39 322	49 833	54 410	57 371	68 973	70 815	73 978
Inward FDI stocks	Mln USD	36 646	52 623	60 625	49 748	55 797	60 237	65 014	74 403
Prices									
Inflation rate: all items	Annual growth %	1,3	2,1	0,5	4,6	3,3	2,7	3,5	1,7
Unemployment									
Unemployment rate: total labour force	%	9,0	8,4	7,3	6,1	7,5	6,6	5,6	6,9

Source: OECD Factbook statistics. For explanatory notes, see OECD Factbook 2013 (DOI: 10.1787/factbook-2013-en)

the Israeli adoption of American capitalism is the main reason. As noted earlier, the USA has the highest level of income inequality among developed countries. Indeed, the official Israeli government in the recent past has been to free the economy from government regulations, increase competition, and reduce the redistribution of income to the point that was recently termed as "piggish capitalism." I would like to suggest an additional explanation based on the attributes of the high-tech industry.

Israel as a start-up nation

In 2009, Dan Senor and Saul Singer published a book titled: Start-up Nation: The Story of Israel's Economic Miracle [6]. In 2010, the book made the best seller list of the New York Times. In this book, the authors claim that Israel became the world's leader of the Hi-Tech industry to the point that it should be considered to be "a start-up nation". It is not the purpose of the present paper to provide a comprehensive analysis of this industry. Yet, a short review is in place. Following are some key indicators of the extent of Israeli start-up Hi-Tech achievements by 2013 (sources: a number of English publications available in the Ministry of Finance [7] and IVC reports [8]).

Israel has 3500 ongoing start-up companies, more than any other country in the world, except the US. Close to 100 Israeli companies, more than any other foreign country, are listed in USA stock exchanges. Of these, 72 are listed on NASDAQ, the American high-technology stock exchange. The remain ingare listed in the New York and the American stock exchanges. Almost every major multinational Hi-Tech company has a subsidiary in Israel (IBM, Microsoft, Intel, Google, Facebook, etc.) Most

Table 2

Gini coefficient, of disposable income, mid-70s to late-2000s

Country	Mid 1080s	Around 1990	Mid 1990s	Around 2000	Mid-2000s	Late 2000s
Israel	**0,326**	**0,329**	**0,338**	**0,347**	**0,378**	**0,371**
United Kingdom	0,309	0,354	0,336	0,351	0,331	0,345
USA	0,337	0,348	0,361	0,357	0,380	0,378

Source: http://en.wikipedia.org/wiki/List_of_countrirs _by_income_equality.

Table 3

Israeli monthly household income by 10 deciles (NIS) 2011

Decile	1	2	3	4	5	6	7	8	9	10
Income	4,432	6,601	8,117	9,427	11,735	14,117	17,081	19,971	25,694	39,849
D10/ D1		1,49	1,83	2,13	2,65	3,19	3,85	4,51	5,80	8,99
D(i)/ D(i-1)		1,49	1,23	1,16	1,24	1,20	1,21	1,17	1,29	1,55

Source: Computed from data included in Israel Bureau of Statistics (2014) Statistical Abstracts of Israel, 2013, Table 5.27, p. 290 [2].

of these subsidiaries opened R&D facilities. To appreciate the extent of this involvement, consider, for example, that Intel invested in 64 Israeli start-up firms and employs 8000 people.

The Israeli High-Tech industry has its roots in the 1970's when leading multinational companies identified the high level of Israeli engineers and researchers, as well as their relatively low cost (wages & salaries), and opened R&D subsidiaries in Israel. A Typical example is IBM that opened such a subsidiary as early as 1972. By the end of the 1980s, many multinational companies took advantage of the Israeli highly skilled labor market. In parallel, technologies developed for defense purposes were adapted to civilian application by Israeli defense companies. A key turning point that accelerated these trends was the 1987 termination of the Lavy project by the Israeli government. In this project, the aviation industry developed an Israeli designed jet fighter airplane. The termination of the project just as the first two prototype planes took to the air, released thousands of highly skilled, trained, motivated and experienced R&D expert to the labor market. Combining the availability of these experts with the extensive inflow of highly educated Russian immigrants, provided a unique labor force. In parallel, the Israeli government led the formation of incubator centers and established the first Israeli venture capital companies (VC). The success of both initiatives, led to the formation of the Israeli VC market as well as the increasing investment by foreign VCs. Thus, by the early 1990s the stage was set for propelling the high-tech industry to its present position.

The impact of the Hi-Tech industry

We are now ready to analyze the impact of the Israeli Hi-Tech industry on the Israeli economy and the Israeli social welfare.

Economic impact of the Israeli Hi-Tech industry

A full appreciation of the economic impact of the Hi-Tech industry, calls for analysis of the financial flows generated by its operations. Let us begin with the initial investments in start-up companies. When a new start-up firm is formed, the risk of failure is so high that no institutional investorcan take the risk and invest in it. At this stage, only individuals, so called "angels", are willing to invest in return for a proportion of ownership. The extent of these investments are, usually, not made public. In the second stage, after the new company proves the viability of its inventions and that there is a potential market for its products, VC companies begin to invest. Due to the high risks that still exists, for all practical purposes, only individuals invest in VC companies. In 2013, 662 Hi-Tech companies were financed by VCs to the tune of 2,3 Billion $USA. In a ten-year period, these investments accumulated to 17 Billion. This flow, which is not influenced by declines in traditional industries has two effects. First, it increase seconomic stability. Second, being an investment, the multiplier effect extends the duration of this impact.

The start-up companies, in turn, compensate the inventors by employment wages and salaries and/or distribution of ownership shares. The light arrows in Figure 1 represent flow of investments from individual investors directly to the start-up company or via a VC.

In the final stage, when its viability has been verified, the start-up company ceases to be a "start-up" either by going public via initial public offering (IPO), or by being bought-out by mergers and acquisitions (M&A). In Israel, most start-up exits are in the form M&A, where multinational companies buy out the start-up companies for the acquisition of their intellectual properties (IP). It should be noted that most start-up companies don't make it to the final stage. Yet, those who survive earn a fortune with respect to the earlier investments in the start-up market as a whole.

In 2013, 80 Israeli start-up exits yielded income of 6,6 Billion $US. In 10 years, 910 companies made an exit with total income of $50,3 Billion. To appreciate the increase in

value of the Israeli start-up firms, it should be noted that in a 10 years period the income generated by start-up exits is 3 time VC investments.

The bold lines in Figure 1 represent exit-generated flows. It should be noted that even if all investments by individual and VCs took the form of DFI, a significant proportion of the exit income remain in Israel in the hands of the inventors and other employees who typically receive profit sharing and bonus payment. Given the relative success of their investments in Israel, foreign investors are most likely to plough-back their share in the exit income. In conclusion, both investment and exit flows contribute significantly to the Israeli GDP, balance of payment and the foreign money reservesof the Bank of Israel. Since in recent years Israeli Angles and VCs contributed a growing of investment in Israeli start-ups, the effects on the Israeli economy is very significant and, as a result, the Hi-Tech industry has led to an economic growth and sustainability.

Social welfare impact of the Israeli Hi-Tech industry

Let us begin with effects the Israeli start-up industry has on poverty. As noted earlier, in contrast with established Israeli firms such as Teva that has invested in R&D in order to improve their Israeli-made product line, most start-up exits take the form of M&Awhere the acquisitions facilitate not only the exit of the original owners but also the exit of the Israeli IP from the country. When this is the case, the acquiring firms establish production and marketing operations somewhere else,

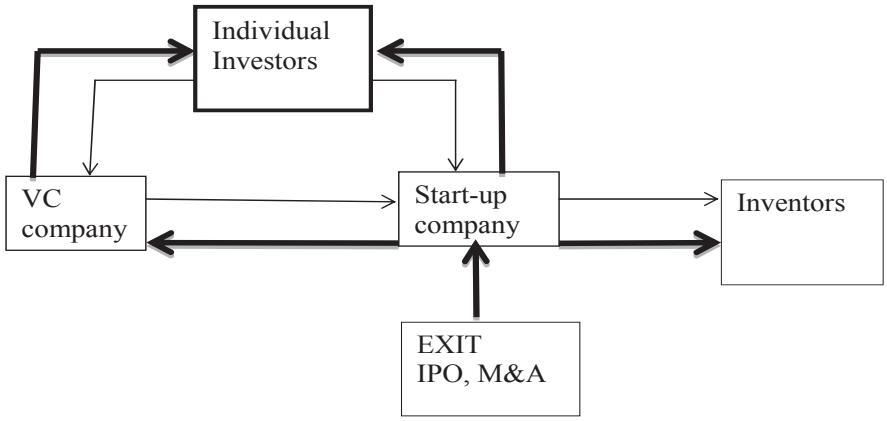

Figure 1. Investment and exit Cash flows to and from a start-up company

Table 4

lists the most outstanding exits of 2013

Israeli start-up	Buying firm	Exit value Million US $
Given Imaging	Covidian	970
Waze	Google	966
Trusteer	IBM	650
Prolor Biotech	OPKO	480
Intucell	CISCO	475

Source: IVC, 2014 [8].

leaving in Israel, at the most, the continued R&D activities. Obviously, these buying firms are interested only in the Israeli-developed IP. By moving all operations abroad, these firms prevent the spillover of economic benefits to the lower strata of society. They do not generate demand for blue-collar workers nor for low level white-collar employees. In line with most Western countries, Israel defines poverty in relative terms, where those whose income is below 1/2 the median income are considered poor. It can be concluded that the Israeli start-up industry with its reliance on exits, at best, has no impact on poverty and it may increase the **measured poverty** by increasing the median income, at worst.

In addition to the start-up segment, other segments of the Hi-Tech industry also contribute to increasing the measured poverty. By focusing on R&D activities, this industry generates strong demand for high level workers with proportionally high need for engineers, programmers, technicians and applied scientists. Wages and salaries, in turn, are relatively high. While industry figures are not readily available, one can get an impression by reviewing a relate field, such as the Knowledge Technologies and Communications. Figure 2 presents the relative wages per wage position in this industry as a percent of the average wage in the business sector.

It can be observed that since 2000, wages settled at close to 220 %, more than twice the business sector average. In addition to supply and demand forces, these high wages are justified by productivity. Figure 3 presents the number of wage earners in the Knowledge Technology and Communication industry as a proportion of total employment in the business sector, while Figure 4 presents the corresponding industry product. As can be seen, during the same period, about 8–9 percent of employees produced about 12 percent of the product output.

In 2012, the average wage in this industry reached 15,500 NIS per month, placing these employees in the 6–7 out of 10 household income deciles. Considering the proportion of the Hi-Tech industry in the national labor force, it should be obvious that these high industry wages increase the household median income, and thereby, the measured poverty.

Next, let us continue with the impact the Israeli Hi-Tech industry has on the level of inequality. Earlier, we described three stages in the life of start-up companies. In the first stage, only individual "angels" invest in a newly born start-up firm. In the second stage,

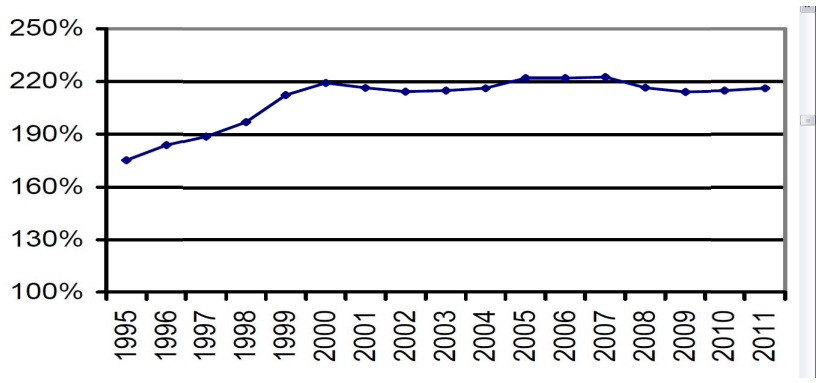

Figure 2. Wages per wage position in the Information Technology & Communication industry as a proportion of corresponding wages in the business sector

Source: Friedmann, Yoav (2913), "The Information Technology Industry: Employees, Wages and Dealing with Shocks," Periodical Papers August 2013, Bank of Israel Research Department P. 8 [9].

VCs join the investors. At these two stages, no institutional money, such as investment banks, pension funds, mutual funds, etc. is invested due to the high financial risk involved. Thus, the huge financial flows generated in stage 3 by M&A, presented by the bold arrows in Figure 1 above, end in the hands of individuals. These include the inventors, angel investors and those who invested in VCs. Among these individuals, both types of investors must have been in the 10th decile, and even more likely in the 1000th decile, prior to their investment in

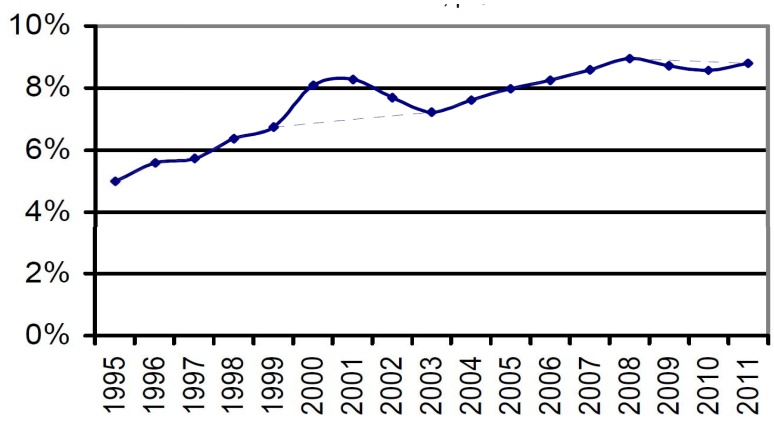

Figure 3. The Proportion of the Information Technology & Communication industry in the labor market

Source: Friedmann, Yoav (2913), "The Information Technology Industry: Employees, Wages and Dealing with Shocks," Periodical Papers August 2013, Bank of Israel Research Department P. 8 [9].

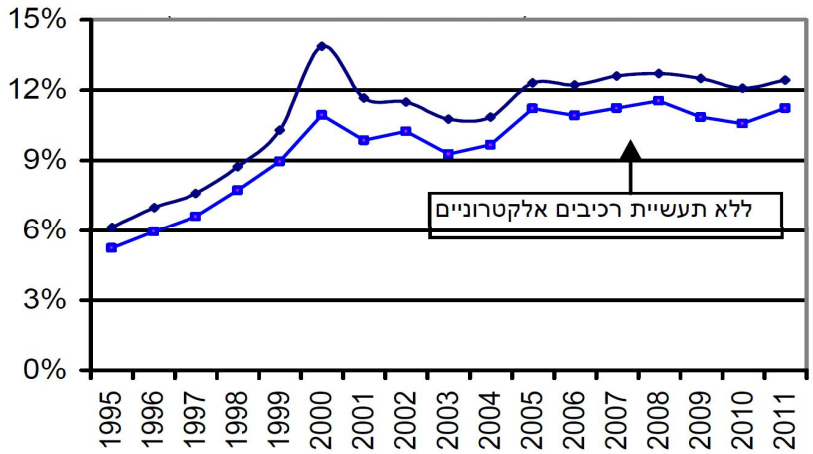

Figure 4: The Proportion of the Information Technology & Communication industry in the product output (The upper curve)

Source: Friedmann, Yoav (2913), "The Information Technology Industry: Employees, Wages and Dealing with Shocks," Periodical Papers August 2013, Bank of Israel Research Department P. 8 [9].

the new start-up. Others simply cannot afford the financial risk. Here the rich get richer, and rightly so, because they took heavy risks and most likely have lost in the past, or will lose in the future, by investing in other start-up companies. Next, let us consider the inventors, theoretically they could come from any social stratum. Typically, they are relatively young, in their 20s-30s, extremely bright, and most likely have served in one of the elite R&D units of the Israeli defense forces. Given this background, they are more likely to come from the upper-middle class, from 6–10 decile groups out of 10. In most cases, the exit will make them Millionaires and move them directly to the 10^{th} or 100^{th} decile, regardless of where they initially came from. Finally, in most cases, all current employees of the start-up as well as past employees who received stock options as part of their compensation, receive significant bonus payments that are likely to move them up the social stratum ladder. Considering all these effects together, when a significant number of exits occur, as is probably the case in Israel, the end result is a significant increase in the income level of the 10^{th} decile with a possibility of upward shifts in additional upper income classes. Such changes, in turn, will increase the extent of income inequality when measured by the 10^{th} decile divided by the 1^{st} decile.

Conclusions

This paper posed the question how can an economy succeed while at the same time social welfare deteriorates. Ruthless capitalism, were the rich get richer and the poor get poorer was presented as a potential explanation suggested in the Israeli press. It should be rather evident that in addition to throat-cut competition, all economic systems that allow a minority to enjoy the fruits of economic development while leaving behind the majority will experience similar results. Dictator ships have been notorious to do so.

The analyses presented in this paper suggest additional explanations. First, one should consider how social welfare is measured. In the Western world, relative rather than absolute measures are usually employed. The justification for this practice is the understanding that humans are social and compare their welfare with those of others. There are also ethical issues that justify the sharing of the national wealth. Yet, the present practice of defining poverty as income levels below half the median income should be reconsidered. The use of 10 percentiles and computing the ratio of the income of the richest decile by that of the poorest is even more problematic. As was shown, these two extreme groups significantly diverge from the rest of society. Indeed, in recent comparative publications of the OECD, were data for all member countries are presented, the 10th decile income is divided by the second rather than the first as the measure of inequality. Other recently employed alternatives include the use of the 9^{th} and 5^{th} percentile groups. Given the Israeli data, dividing the 8^{th} percentile by the 2^{nd} should be tested as a best compromise.

Second, sometimes, income inequality, to a certain degree, is fully justifiable. Let us take the Israeli social scene as an example. Maslow defined human needs as a sequence of pre-requisite priorities where the fulfilment of more basic needs is required before addressing higher needs. The sequence begins with the need for survival, followed the for protection, comfort, social needs and culminating in self-actualization as the highest need that in most societies is never reached. In Israel, the Ultra-Orthodox Jewish social segment considers the continued life-long religious learning by men at a very high priority, even before minimal economic comfort. They prefer to engage in continued learning rather than in gainful employment. Thus, what others consider self-actualization, these men consider a more basic need. As a result, their household income is relatively low and they compose a large portion of the lowest two income percentiles. Given this background, is it logical to take their

low income as the basis for computing income inequality? Obviously not. On the other hand, as shown earlier, the start-up industry justifies the relatively higher income of the 10th decile. Combining both phenomena, measuring the extent of inequality in Israel by dividing the richest income decile by the poorest one is totally inadequate. Furthermore, comparing this measures with those of other countries yield totally biased results. In conclusion, local conditions should be accounted for in all multinational studies.

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